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(54) Motor vehicle having an oil cooler

(57) In a motor vehicle, an oil cooler (12) is disposed in front of a water-cooler or radiator (3) as seen in the direction of flow of the cooling medium. To enable an unimpaired access to the surface of the oil cooler (12) to be cleaned with a minimum of time and constructional expenses, the oil cooler (12) is pivotably mounted to one of the side surfaces (11) of the radiator (3) by

means of a hinge (14, 15) and is pivotable away from said radiator. The hinge axes (20) is inclined relative to a vertical line under an angle (21) which is an acute angle directed forwardly and downwardly relative to the vertical line.

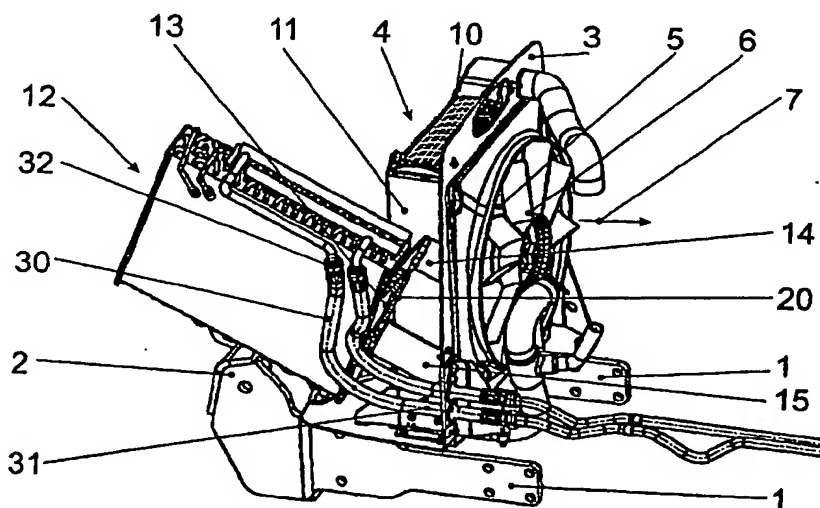


FIG. 2

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Description

[0001] The present invention relates to a motor vehicle having an oil cooler disposed in front of a radiator as seen in the direction of flow of the cooling medium therethrough, said radiator having an inflow and an outflow surface, two side surfaces as well as top and bottom surfaces.

[0002] Oil coolers are used in conjunction with motor vehicles for cooling the motor oil and/or the transmission oil. With utility vehicles, and especially agricultural vehicles, they are also used to cool the operating fluid of lifting devices or other systems. In most cases, these oil coolers are disposed immediately in front of or behind the radiator and parallel thereto, depending on whether the cooling fan is disposed in front of or behind the radiator.

[0003] To maintain the cooling efficiency of an oil cooler at an acceptable level, even in a contaminated environment, it has to be cleaned periodically. This is usually done by blowing air or a liquid through the oil cooler in a direction opposite to the direction of flow of the cooling medium during normal operation. For this purpose, the oil cooler has to be moved sufficiently far away from the radiator so that it is accessible from the rear side, especially when it is mounted in front of the radiator.

[0004] In most cases it will be necessary to uninstall the oil-cooler, involving a substantial expense of time. From the STEYR-tractors of the series 91 it is known to pivot the oil cooler in its own plane parallel to the inflow surface about an axis extending along the direction of flow of the cooling medium. However, since the coolers are installed in a vehicle, this pivotal movement is possible only in a limited manner such that a portion of the surface to be cleaned always will remain inaccessible. The pivotal movement is not only limited by the wheels and the frame of the vehicle but also - in the case of an agricultural utility vehicle - also by the front lift device or by the ballast weights.

[0005] It is therefore an object of the invention to propose an arrangement of the oil cooler which allows an unimpaired access to the complete surface to be cleaned with a minimum of time and constructional expenses.

[0006] For this purpose and in accordance with the invention, the oil cooler is pivotably mounted by means of at least one hinge to one of the side surfaces of the radiator and is pivotable away therefrom. The oil cooler therefore may be pivoted to the side - similar to a door. Even if it is pivoted only about a square angle, it is fully accessible for cleaning purposes. No oil conducts have to be removed if these are at least partially constituted by flexible tubes. In view of the hinge movement, there is only a small change of the length of these flexible tubes, such that a short loop is sufficient to accommodate the movement.

[0007] According to a further aspect of the present

invention, the hinge axis of said at least one hinge is inclined at an angle relative to a vertical line. By inclining the hinge axis, the path of movement of the pivoting oil cooler may be modified such that no collision will occur with components which would hinder this movement in case a vertical hinge axis would be employed.

[0008] According to a preferred embodiment of the invention, said angle is an acute angle directed relative to a vertical line in a combined forward and downward direction. On pivoting away, the oil cooler therefore initially follows a path directed upwardly such that it avoids obstacles in front of it. Such obstacles may be: frame portions, a bumper, parts of the front lift device, or ballast weights.

[0009] A non-limiting embodiment of the present invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a perspective view showing the subject of the present invention in a first position; and Figure 2 is a view similar to Figure 1 but showing the subject of the invention in a second position under a different angle of view.

[0010] In Figure 1, the chassis or frame of a vehicle is only partly shown and indicated with reference number 1. This may represent the vehicle chassis, a front axle support body, or the support of a lifting unit. In the last mentioned case, the frame itself is not shown. This frame 1 ends at its front end in a head portion 2 which equally well may be a portion of the body of a vehicle, the bumper, or a support for the ballast weights. A radiator 8 or water cooler is fixedly mounted to this frame 1. The radiator is a plane, flat box having an inflow surface 4 (hidden) and an outflow surface 5 (see figure 2) which is partly hidden by a radiator cowl. In the embodiment shown, the plane of the inflow and outflow surfaces 4, 5 extends vertically, but it also might be inclined. A cooling fan 6 (see Fig. 2) is disposed in the cowl and provides a flow of the cooling medium (in the present case ambient air) along a direction as indicated by reference number 7.

[0011] Between its inflow surface 4 and outflow surface 5, the radiator 3 is surrounded by top and bottom surfaces and side surfaces, only one top surface 10 and one side surface 11 being visible. In front of the radiator 3, i.e. in upstream direction relative to the direction of flow 7, an oil cooler 12 is provided. The oil cooler is also a flat box extending mainly in a plane parallel to the inflow surface 4 of the radiator. Also only one side surface 13 of the oil cooler may be seen in the drawings. In Figure 1, the oil cooler is disposed in the operational position.

[0012] The side surface 13 of the oil cooler 12 and the side surface 11 of the radiator 3 are disposed in the same plane and are pivotally connected with one another by means of two hinges 14, 15 having flanges welded or bolted to the two side surfaces 11, 13. The

hinge axis indicated at 20 is disposed in a vertical plane wherein it is inclined under an angle 21 in a combined forward and downward direction.

[0013] The oil cooler 12 is connected via flexible oil tubes 30 and oil pipes 31 to the components to be cooled (engine, transmission and so on). The flexible oil tubes 30 are provided between the oil pipes 31 guided along the radiator 3 and fittings 32 arranged on the oil cooler 12, respectively.

[0014] Figure 2 shows the same arrangement in the cleaning position. The oil cooler 12 has been pivoted away from the radiator 3 over nearly a square angle about the hinge axis 20. As a result of the inclined installation of the hinge axis 20, the oil cooler 12 is not obstructed in its pivotal movement by the head portion 12. It is now possible to clean the oil cooler 12 on its exposed side by thoroughly blowing through it over its full surface. The flexible oil tubes 30 may accommodate the pivotal movement of the oil cooler 12 without any problem and without any substantial change of their position. If the oil cooler 12 is then pivoted back into its operational position according to Figure 1, it may be fixed in this position by means of a latch or catch or similar means not shown.

Claims

1. An oil cooler (12) for a motor vehicle which is disposed in front of a radiator (3) as seen in the direction of flow of a cooling medium, said radiator (3) having an inflow and an outflow surface (4, 5), two side surfaces (11), and a top and bottom surface (10, -), and
characterized in that said oil cooler (12) is pivotably mounted to one of the side surfaces (11) of the radiator (3) by means of at least one hinge (14, 15) and may be pivoted away from said radiator (3).
2. An oil cooler according to claim 1, characterized in that the hinge axis (20) of said at least one hinge (14, 15) is inclined relative to a vertical line by an angle (21).
3. An oil cooler according to claim 2, characterized in that said angle (21) is an acute angle directed in a combined forward and downward direction relative to a vertical line.
4. An oil cooler according to any of the preceding claims, characterized in that at least part of the oil conducts (30, 31) leading oil to and from the oil cooler (12) are flexible.
5. A motor vehicle characterized in that it comprises an oil cooler (12) in accordance with any of the preceding claims.
6. A motor vehicle according to claim 5, characterized in that a vehicle chassis part (2) is located in close proximity in front of said cooler (12) as seen in the flow direction of the cooling medium through the cooler (12) and comprises a top portion which extends above the bottom surface (-) of the cooler; said at least one hinge (14, 15) being arranged such that, upon pivoting the cooler (12) away from the radiator (3), part of the cooler (12) is lifted to procure unobstructed passage of at least part of the cooler (12) over and above said top portion of the vehicle chassis part (2).

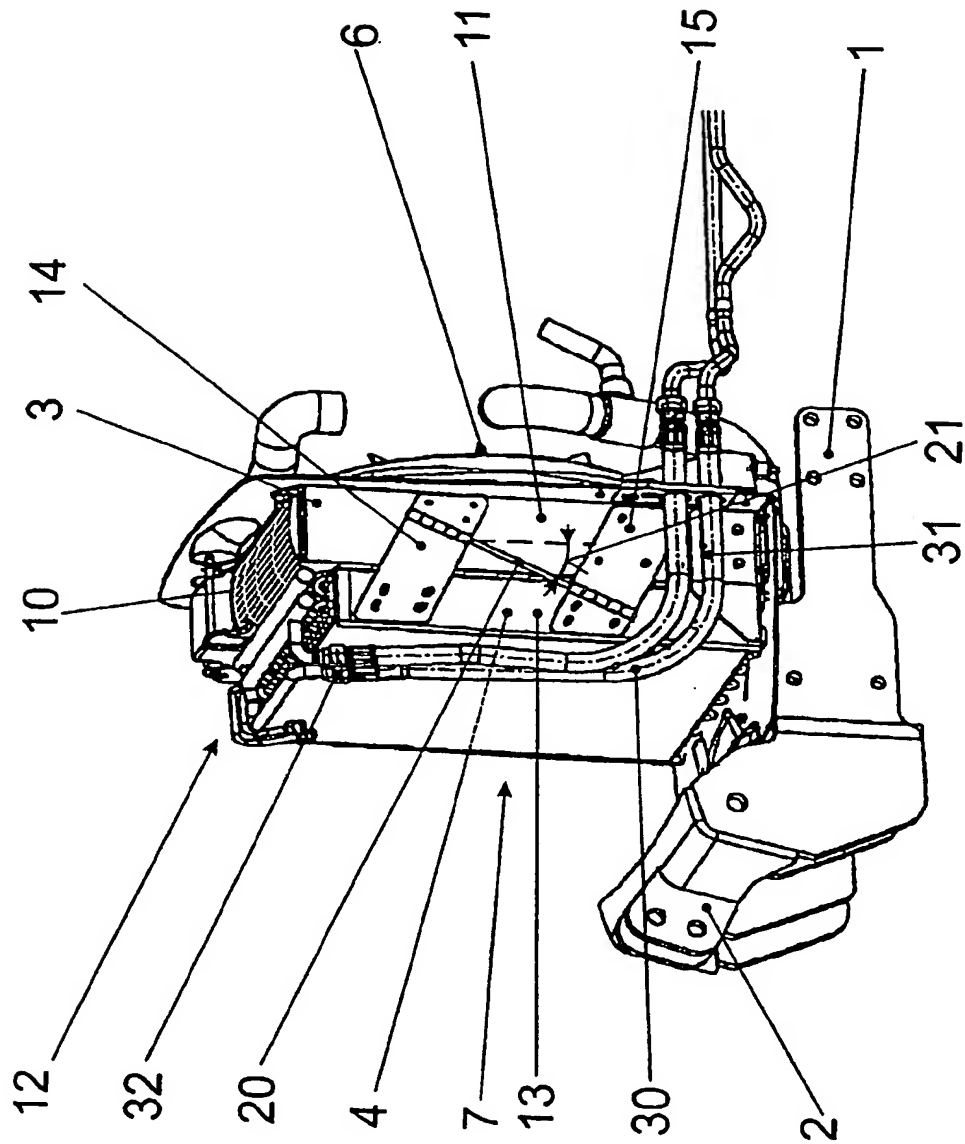


FIG. 1

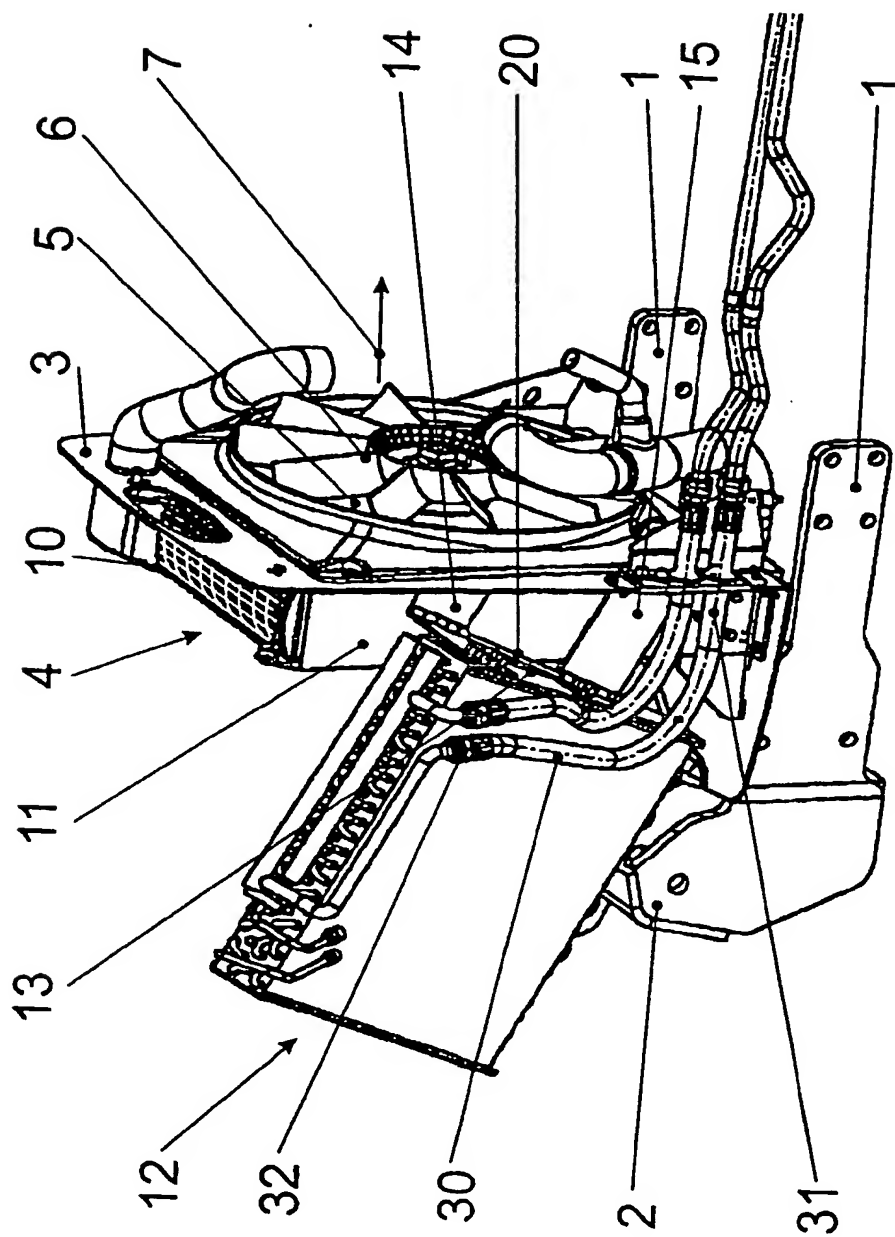
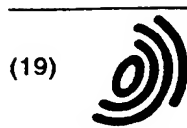


FIG. 2



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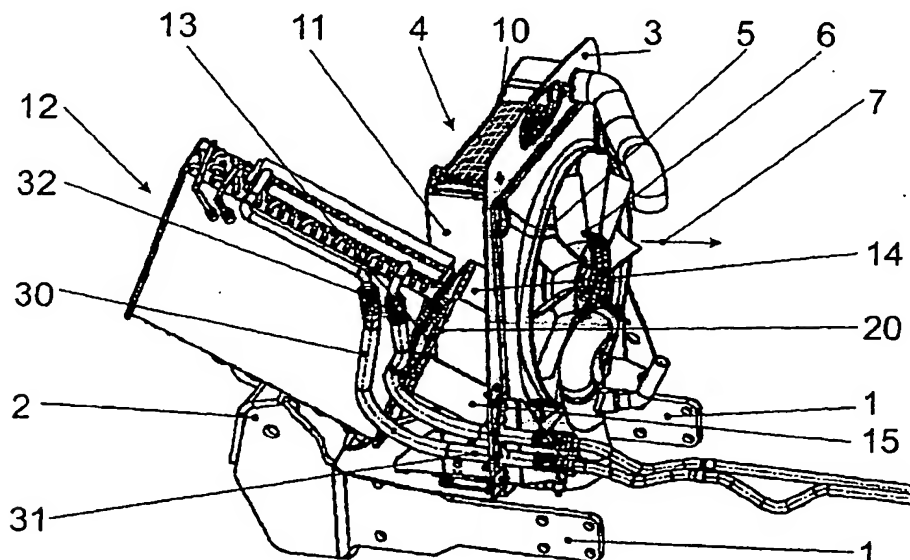
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**FIG. 2****EP 1 098 073 A3**



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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 3695

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 3 297 080 A (WILLIAMS ET AL.) 10 January 1967 (1967-01-10) * column 2, line 20 - line 26 * * column 2, line 66 - column 3, line 4; figures *	1,4,5	F01P3/18 F01P11/08
X	US 3 334 704 A (GEHRKE ET AL.) 8 August 1967 (1967-08-08) * column 4, line 28 - column 5, line 12; figures *	1,4,5	
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E	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 19, 5 June 2001 (2001-06-05) - & JP 2001 041043 A (SHIN CATERPILLAR MITSUBISHI LTD), 13 February 2001 (2001-02-13) * abstract *	1-6	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F01P
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28 January 2003	Examiner Kooijman, F
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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28-01-2003

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82